Evaluating the Six-Year Technology Plan and the Use of Technology in the Commonwealth

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Evaluating the Six-Year Technology Plan

The Six-Year Technology Plan was written to provide structure and direction to the on-going development of educational technology in the Commonwealth. The Plan is built on five interdependent major goals. Each goal is designed to work with the others to contribute to the Plan's potential for success in reaching the overall Vision for technology in Virginia:

> Virginia students will be empowered to use current and emerging technologies for continued learning to become productive, creative citizens of the 21st century (Virginia Department of Education, 1996).

The **fifth g**oal, Evaluation, was included "to provide for a system of on-going evaluation of technology initiatives as expressed through the various recommendations in the plan." The Virginia Educational Technology Advisory Committee (VETAC) should be empowered to use the structures developed in the Six Year Plan to periodically review and evaluate progress and effectiveness and to make recommendations to the Superintendent of Public Instruction.

This periodic review would provide the committee and the State Superintendent with the information needed to be able to comment on the overall effectiveness of the Plan. These comments would focus on the effectiveness with which the Plan has accomplished its primary mission: facilitating- the dissemination of resources for infrastructure, technology-based instruction, training and technical assistance, and administrative services.

The Plan itself is aimed at providing specific resources (fiscal, material, staff development, information) to localities to enable them to work more effectively with students and within their administrative structures. Given that the main concern of the Plan is facilitating the instructional use of technology, however, we must look to ways to determine the effectiveness with which new resources are being used for their intended purposes. In other words, different ways to build accountability for the implementation and effective use of resources provided through the Plan need to be developed.

In order to build these structures, one must look in two directions. The first direction deals with the effectiveness of technology generally. The question raised is whether or not the placement of the technology in the schools, the investment made by the Commonwealth, actually has an impact on measures of student success, such as test scores. This question is best addressed through an analysis of the technology environment in the school as a whole, done in relation to student achievement. Quantitative methods are appropriate as a primary focus.

The second question asks whether specific technologies are being, used effectively in different content areas. This is especially applicable for specific applications and technologies, such as integrated learning systems software with desktop computers, distance learning, and scientific probes. The question here relates more to the impact of a narrow ran-e of technologies on a comparatively narrow range of students. Because of the more narrow focus, and the difficulty of controlling the manner in which these different technologies are used, a case study approach may be more appropriate.

Technology and Student Achievement

Determining the general impact of technology, on student achievement has been the subject of much discussion, and has generally been the source of a good deal of frustration. The desired data and information have simply not been available (Melmed, 1995). The overall effect is not the sum total of the individual technologies in use in a given school, school division or state - it goes well beyond that. Even if it were, it would be all but impossible to assess the impact of each and every technology in an organization to be able to add them up to a sum total. The impact of technology is much more than the simple sum of the technologies used, and many of these impact statements will be quite unique to the specific site.

Although we cannot assess each individual technology and add the impact statements together, we can measure the impact of a technology-rich environment on student achievement (Glean and Melded, 1996; Grim, 1996). The concept of a technology-rich environment has been defined in terms of three factors: internal connectivity, external connectivity, and adaptability (Grim, 1996). These areas cover the various contributions made by the Commonwealth through the Legislature's action to fund some of the Six-Year Technology Plan initiatives. Internet and other network infrastructure contributions are included in the connectivity categories, and individual computers, home use, distance learning, graphing calculators, assistive technologies and staff

development are all a part of the adaptability area.

By carefully defining incremental levels of richness, and the contribution of each segment of the definition, different schools could be broken into classifications based on the technology they have available and the degree to which staff use those opportunities. From there, the test scores of different schools at any level could be compared. If the technology is, indeed, having an impact, then one would expect that the scores in the technology, rich schools would be higher than those of other schools. This is, in fact, what Grimm found in CIY his 1996 doctoral study.

Usin2 Specific Technologies Effectively

Different technologies have different goals for their impact on students. Graphing, calculators, for example, look to focus on specific mathematical tasks and to increase student abilities in problem solving. Distance learning technologies are used to overcome fiscal disparities and to increase the number of students who have cost-effective access to specialized learning experiences that they would otherwise have to forego. Assistive technologies for special education students facilitate their access to least restrictive environments.

Unless each technology is split out, their widely differing purposes make realistic, meaningful assessment all but impossible. The Plan covers only a limited number of technologies, and school divisions will acquire technologies other than what the Commonwealth provides. The most effective way to assess the impact of the individual initiatives is to target them through case studies.

Each individual area addressed by the Six-Year Educational Technology Plan for Virginia can be assessed on a case-study basis. By focusing on individual case studies, the evaluation can deal specifically with the effectiveness of the different technologies in different environments.

In conclusion, the different segments of the Plan can be assessed by combining the evaluation section of the Six-Year Educational Technology, Plan for Virginia with other professionally designed and implemented, evaluations focused on student achievement. In other words, it is indeed possible to examine the effectiveness of the Commonwealth's established direction to increase the technological richness of its schools through a combination of general quantitative study and more qualitative case study data targeting, specific technologies.

Using Technology to Support Student Learning of SOL

Research studies conducted during the 1990's show positive results in the use of computers and related technologies as instructional tools (VDOE, 1996). According to one 1996 study, for example, "Numerous studies of a wide variety of specific applications of technology show improvements in student performance, student motivation, teacher satisfaction, and other important outcomes." This RAND Corporation study of **five** technology-rich schools notes improved student attitude, greater student engagement, livelier classroom content, improved norm-referenced standardized test scores, improved student retention, improved job placement of secondary school graduates, increased student enthusiasm for learning and an increased student commitment and responsibility for learning. It also cautioned that "Traditional ways of assessing the effectiveness of educational programs are generally deficient for assessing the contributions of technology." (Glean and Melded, 1996).

Other studies, cited in a recent comprehensive report on the effectiveness of technology, have also shown increased student academic achievement in the various content areas. Word processing was shown to enhance reading achievement. Multimedia environments had a positive effect on student auditory and oral skills. Mathematics software improved student retention and use of information. In Science, content-specific tool software, simulation software, and analysis software produce increased achievement. Based on the results of these studies, continued use of computers and related technologies can result in continued academic achievement by K-12 students (Sivin-Kachala and Bialo, 1996).

Cost Savings and Instructional Effectiveness of Distance Learning

The Virginia Satellite Educational Network (VSEN, formerly the Electronic Classroom Pro-ram) is designed to address educational disparity in Virginia. VSEN offers students in small to medium sized schools an opportunity to take Advanced Placement (AP) classes, designed by the College Board and normally implemented locally.

In 1995, twenty-five percent of the VSEN students lived in areas of the state with unemployment rates greater than ten percent of the population. For an average participating school, the cost of on-site instruction would be approximately $8,5000 - $9,000 per student. The average VSEN cost to produce one course in the same school year, however, is $890 per student.

Without the distance learning opportunity, localities would simply not be able to afford to offer these low enrollment classes. In 1996-97, VSEN enable 2,400 students from 120 Virginia schools and thirty tuition paying schools outside the state to take

advantage of these advanced classes. The average class was size between five and nine students, and performance on the appropriate Advanced Placement Examinations was equal to, or better than, students from localities offering the classes in regular format.

Virginia schools and the Effective Use of Technology as a Resource to Support Student Learning

Virginia is identifying key strategies for achieving effective use of instructional technology across all areas of the State as part of its assessment effort. Pockets of success are not acceptable. Equity of access, training, and effective utilization are the Department's goals.

Current surveys and studies will beam to reveal the extent of use of technology in Virginia schools. The 1996 **t@** Virginia State Technology Survey Report by Quality Education Data (QED) provides baseline technology assessment data. This data will serve as a benchmark for future surveys (QED, 1997).

The QED survey shows that eighty-eight percent of the reporting school divisions have a division level technology coordinator, suggesting a high level of instructional technology use. Further, seventy-seven percent reported that they have a technology-training program, showing a continuing, effort to improve the level of teacher effectiveness thorough the use of technology in the classroom.

Educational Data Systems is due to release a report on educational technology in the Spring of 1997, and the results of a 1996 Department of Education survey on local implementation of the new Standards of Learning will be available around the same time. These reports will provide additional insight into the use of technology in the classrooms of the Commonwealth.

The Cost-Effectiveness of Infrastructure as a Means of Providing Educational Opportunities in Various Settings

The infrastructure must be viewed as an essential component of information dissemination. It can no longer be considered an option or a luxury in Virginia public education.

The wealth of information on the Internet is unparalleled by any other source in -the history of mankind. Access to most of this information is free. School libraries will effectively have an interlibrary loan program that will sweep the globe and make vast amounts of information available instantly, dramatically reducing the time required to research a subject (Riel, 1996). When direct Internet access is brought to a building campus, it is the infrastructure that allows access from all computers attached to it, distributing information much like electrical outlets distribute power.

The infrastructure allows for a more effective and direct dimension of communication. Personal sharing of information can be achieved and collaborated upon across the world as easily and inexpensively as it is achieved between and within classrooms in the same building or between buildings on the same campus (Lescrold, 1992). Current developments in communication technology now provide new options for students to extend themselves across distances and through time (Riel, 1996). Students are exposed to a more diverse perspective, because of the abundance of sources of information to which they have access.

In cases where a physical field trip is not possible, a virtual site visit represents a cost-effective alternative. This is especially true for disabled students. Virtual exhibits make possible a wide variety of experiences without the necessity of travel or scheduling (Deed, 1995). In rural areas, the infrastructure serves as a means of information transport to hard-to-reach or remote places (NTIA, 1995).

The right strategies can lessen the impact of technology obsolescence (Scrogan, 1995). Infrastructure does not become obsolete as quickly as other components of technology. New computers are designed to take advantage of existing infrastructures. An appropriate infrastructure will service a building, for many years.

The infrastructure allows for the sharing of educational resources. Multiple access, achieved through the infrastructure, allows for more than one computer to share peripherals. For example, one laser printer or CDROM drive can service a workgroup or lab. This eliminates expenditures required for each computer to have its own devices (Carlitz and Hastings, 1995).

Because digitized resources are not printed and bound, they do not wear and are less expensive to produce and maintain. There are less replacement costs. The presence of these collections on the World Wide Web gives teachers and students opportunities to work with an extraordinary array of authentic materials and up-to-date information (Honey and Hawkins, 1996).

The infrastructure allows for the creation and utilization of new forms of student expression. It allows for interactive learning to occur at each student's own pace. A student has more control of his own learning experiences. With an appropriate infrastructure accessing the Internet, the challenge shifts to one of not getting enough information to one of surviving- amid too much information (Dede, 1995).

Determining the Utility and Amount of Internet Usage in Schools

Because there are several different methods of access to the Internet, the question of determining the amount of Internet usage in schools is perhaps best determined through feedback from the localities.

To say most schools have access to the Internet can be a misleading statement. A fundamental question that must be answered pertains to the method of Internet access being used by the schools.

Basically, there are three different methods of access to the Internet: Two of these methods involve dial-up access, in which the connection to the Internet is established by dialing up the Internet service provider (ISP) though means of a modem and regular analog phone lines. Of these two dial-up methods, one is a pure Internet connection, where the computer dialing up the Internet uses TCP/IP as a native protocol and has its own IP address. The second and less preferred dial-up method involves indirect Internet access though a larger network, such as America Online or Prodigy. Both dial up methods are normally achieved and licensed on a per computer basis, and there is no infrastructure necessary other than a phone line and a modem.

The third and best method of access is that of a direct connection. Direct Internet access allow all the computers comprising- the local area network (LAN) to access the Internet over one or more digital high speed data lines that are typically leased from the telephone company (TELCO). This type of access normally requires some in-house expertise to maintain and assign ranges of IP addresses to computers on the LAN. Many organizations with direct connections also apply for and establish their own domain names and have computers, which act as Internet servers. Direct Internet access takes advantage of the building's internal infrastructure, which represents an investment, which has already been made by the Commonwealth.

As more computers in the building are attached to the Internet, dial-up methods of access become increasingly cost prohibitive. This is because each computer typically requires its own phone line and Internet subscription, both of which involve recurring monthly costs on a per computer basis.

There is a proliferation of software available to monitor the amount of Internet usage in a directly connected environment. In addition, through the use of proxy servers, many undesirable Internet sites can be blocked from being accessed in a directly connected environment.

In any case, each locality must be responsible to administer and monitor Internet access as it relates to Virginia's Standards of Learning. Teachers must be trained in use of Internet administration. Accountability standards should be developed and teachers and technology personnel must be aware of these accountability issues as they relate to Internet utility and usage.

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